

No. 7.—*Bird Remains from the Oligocene Deposits of Torrington,  
Wyoming*

BY ALEXANDER WETMORE

For three field seasons the Museum of Comparative Zoölogy has collected fossils in a remarkable deposit near Torrington, Wyoming, that among a wealth of mammals has yielded the largest collection of bones of birds from fossil deposits older than the Pleistocene that have yet been discovered in North America. The bird remains in question have been placed in my hands for study and report on them is given herewith.

According to information supplied by Erich M. Schlaikjer, who has conducted the field work during which this material was collected, the Torrington fossil quarry is located at the head of a canyon, principally in the south half of the northwest quarter of Section 32, Township 24 North, Range 61 West of the Sixth principal meridian.

Mr. Schlaikjer states that "the fossil deposit is of Oligocene age, its stratigraphic position being approximately eighty feet above the Chadron-Brule contact. It presents an outcrop of bones a half mile in length and from one to three feet in thickness. The mammals most abundantly represented are *Mesohippus*, *Caenopus* and *Elotherium*, with remains of birds in most unusual abundance. At a conservative estimate there are at least six bird bones in every cubic foot of the deposit.

"The matrix is a very fine grained pinkish clay and contains a high percentage of calcium carbonate and volcanic ash. Throughout a large part of the deposit the matrix is comparatively hard and is somewhat difficult to work. Where the principal excavations are located, however, the bones occur in soft clay. Above the bone deposit is a two foot layer of clay containing occasional bird and carnivore remains. Above this is a one to four foot layer of white, cherty limestone. Only one or two bone fragments have been found in the limestone."

The bird material, which as has been stated is abundant, is fragmentary, consisting in the main of the articular ends of the metatarsi and tibio-tarsi, with occasional bits from other parts of the skeleton. Rarely a complete bone is encountered. The material is disassociated, except in few instances, viz. an articulated foot. About half the specimens are more or less distorted by pressure, but many are perfect. All are heavily fossilized and are dull white in color.

The collection adds appreciably to our somewhat scanty knowledge of the birds of the Oligocene, as will be indicated in the descriptions that follow.

The drawings illustrating the specimens are the work of Sydney Prentice.

## Order FALCONIFORMES

### Family ACCIPITRIDAE

#### Subfamily BUTEONINAE

#### BUTEO ANTECURSOR new species

*Characters.* Metatarsus similar to that of *Buteo alcs* (Wetmore)<sup>1</sup> but posterior semilunar groove more open; second trochlea relatively more massive; facet for articulation of first toe much longer, extending farther up shaft.

*Description.* Type, left metatarsus, nearly complete (figs 1-5), Mus. Comp. Zoöl. Cat. no. 2233, from Upper Oligocene, four miles from Torrington, Goshen County, Wyoming, collected in 1930 by Erich M. Schlaikjer. Proximal face of head roughly rectangular; external glenoid facet very slightly concave, the internal one larger, more deeply hollowed and sloping slightly toward front; intercondylar tubercle low and broad; internal glenoid facet at higher level than outer one; anterior semilunar groove very slightly indicated; posterior semilunar groove deep with inner wall rising high on the projecting talon, and outer wall sloping outward more gradually; external face of head with outline square, internal face with angles rounded; a deep impression on anterior face of upper end of shaft, with the upper end overhung abruptly by the head, merging below gradually with the anterior groove; tibialis anticus tubercle strong, placed externally to center of shaft; shaft strong but slender, somewhat expanded at upper end, contracted slightly toward center, and then flattened and expanded below to support trochlea; anterior groove a shallow, open channel that becomes less evident as it proceeds downward, and finally disappears opposite center of attachment for first metatarsal; outer face of shaft nearly plane, with only a slight concavity evident, expanding gradually from either end in a long slope to center, meeting the anterior face of the shaft throughout its length at a sharp angle; inferior

<sup>1</sup> *Geranoaëtus alcs* Wetmore, Ann. Carnegie Mus., vol. 16, April 10, 1926, p. 403, pl. 38, figs. 1-5. Miocene.

foramen moderate, placed in a shallow, sharply marked groove that becomes deeper at the foramen and continues as a sharply marked



Figs. 1-3. Three views of type of *Buteo antecursor*, natural size.



Figs. 4-5. Proximal and distal ends of type of *Buteo antecursor*, natural size.

sulcus to terminate in the external inter-trochlear sulcus; inner margin of shaft compressed to a plate that is thin above, becoming gradually thickened until it terminates at the first metatarsal attachment;

attachment for first metatarsal long, well impressed; external head of talon low, curving outward, with external margin cut by a deep notch, the internal margin rounded; internal head of talon projecting as a thin blade, with internal distal margin slightly hooked, and external margin slightly rounded, sloping below, abruptly at first and then swinging gradually to merge in a long, slightly raised line into the shaft; posterior face of shaft excavated by a broad groove that continues practically throughout its length, both margins being sharply indicated; external trochlea flattened, swung slightly outward, compressed on free margin (which is broken away); middle trochlea broad and strong, with lateral margins swollen, and lateral faces concave, its free surface traversed by a groove that extends clear around the articular surface; internal trochlea with an outwardly projecting, flattened, winglike process, its outer face deeply impressed by a rounded, cup-like depression.

*Measurements* (of type). Total length 90.8 mm.,<sup>1</sup> greatest breadth of head 16.7 mm., greatest breadth across trochlea 18.1 mm., smallest transverse diameter of shaft 7.8 mm.

*Remarks.* This new form, somewhat larger than the living ferruginous rough-legged hawk *Butco regalis*, carries the history of its group back one more step, since previously hawks of this kind have not been known earlier than the Miocene. Its discovery is another indication of the early development of the buteonine type of slow-flying, sluggish hawks that seem to have had as much diversity in the past as in the present time. The regularity with which their fossilized remains are found bespeaks an abundance commensurate with that known for living species before their numbers were decimated by man under mistaken ideas as to their destructiveness to valuable animal life. The group as a whole has had unbroken continuance from the Oligocene period to the present.

The type of *Butco antecursor* is unusually complete considering its age. The shaft is somewhat twisted by compression but the processes are practically complete so that there is no difficulty in ascertaining its characters.

#### ACCIPITRIDAE, miscellaneous

In addition to *Butco antecursor*, described in this paper, there are remains of three additional species of hawks of this family that are represented by bones in too fragmentary condition to allow sufficiently

<sup>1</sup> Bone slightly deformed by compression so that original length may have been slightly more.

certain identification to warrant names. These will be listed here with the hope that further material representing them may come to light with continued work in the quarries at Torrington.

The most important of these is a left humerus lacking the head that comes from an eagle a trifle smaller than *Aquila chrysaetos*. The distal end of this bone is fairly complete but the shaft has been crushed to such an extent that its original form and proportions are uncertain, and there has been some distortion in the position of the elements of the distal end. The principal peculiarity evident is the position of the radial tubercle which slants inward at more of an angle than in any living species available for examination.

A second eagle, of larger size, is represented by an unguis that is larger than any of the claws of the bald eagle, being equal to the largest in the great monkey-eating eagle of the Philippines, *Pithecophaga jefferyi*, a species that possesses feet of maximum strength and size in this family. Although species have been described from similar specimens in the past the practice of naming such remains is of dubious value due to the confusion that must exist as to their subfamily and generic relationships.

A third species of hawk is represented by the fragmentary distal end of a right tibio-tarsus. This is peculiar in the large size of the internal condyle in relation to the transverse breadth of the bone, differing in this from any of the modern hawks of the family Accipitridae that I have seen. Parts of the external condyle are missing.

## Order GRUIFORMES

### Suborder CARIAMAE

#### Family BATHORNITHIDAE new family

Legs only moderately elongated; internal trochlea of metatarsus considerably elevated in relation to middle trochlea; no hallux; talon produced downward in an elongated ridge that merges gradually into level of shaft at about one-fourth to one-third the length of the latter; proportions of anterior phalanges about as in the Cariamidae.

Only one genus, *Bathornis*, with three species is at the present time allocated in this family which was erected originally as the subfamily *Bathornithinae*<sup>1</sup> for the species *Bathornis veredus* Wetmore. The type of *veredus* consisted of the lower end of a metatarsus that in original

<sup>1</sup> Proc. Colorado Mus. Nat. Hist., vol. 7, no. 2, July 15, 1925, p. 13.

study indicated puzzling resemblances to *Cariama* and to the Oedienemidae. Misled by the relative positions of the trochlea, a primitive character, which in *Bathornis* are exactly what is found in the thick-knees, and differ from the modern cariamas, I finally placed this new subfamily in the Oedienemidae. My assumption that *Bathornis* might possibly have a first toe proves since to be without basis.

The more complete material of the two new species of *Bathornis* described beyond in the present paper indicates clearly that the genus is related to the cariamas, though close resemblance in certain details of the entire metatarsus indicates a most interesting similarity to the thick-knees, this being evident in the form of the elongated talon which is quite different from the square, block-like structure of *Cariama*. Fortunately the Torrington material includes a foot, found articulated in position, in which the relative proportions of the phalanges are exactly like that of the Cariamidae and are entirely different from the Oedienemidae; this with other characters shows definitely that *Bathornis* belongs in the suborder Cariamae. The resemblances to the Oedienemidae would seem to be only a most interesting and unusual convergence occasioned probably by similarity in habit.

The three species of *Bathornis*, with the fairly complete information now available regarding their lower limbs, present differences from the Cariamas sufficient to warrant their separation in a distinct family. The relation of the Bathornithidae to the family Hermosiornidae of South America is not entirely clear but from the account of Rovereto<sup>1</sup> the two seem to differ in such a way as to warrant the assumption that they are distinct. According to Rovereto's description and plates *Procariama simplex* has the arrangement of the trochlea quite different from *Bathornis*, and the head of the metatarsus, particularly the hypotarsus, like that of *Cariama*. *Hermosiornis milne-edwardsi* also seems very closely allied to *Cariama*.

#### BATHORNIS CELERIPES new species

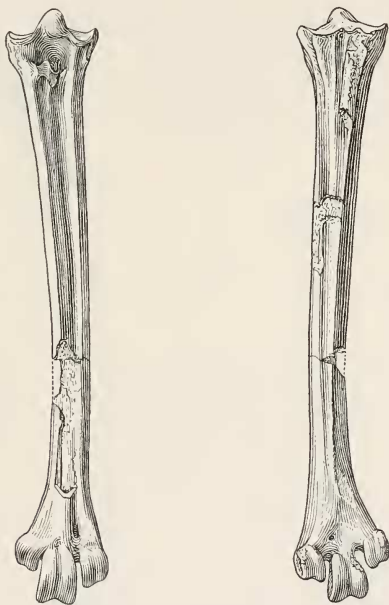
*Characters.* Metatarsus similar to that of *Bathornis veredus* Wetmore<sup>2</sup> but decidedly smaller; outer margin of inner trochlea less produced posteriorly.

*Description.* Type, left metatarsus (figs. 6-11), Mus. Comp. Zoöl. Cat. no. 2234, nearly complete, from Upper Oligocene deposits four miles from Torrington, Goshen County, Wyoming, collected by Erich

<sup>1</sup> An. Mus. Nac. Hist. Nat. Buenos Aires, vol. 25, 1914, 110-114, 163-172.

<sup>2</sup> *Bathornis veredus* Wetmore, Proc. Colorado Mus. Nat. Hist., vol. 7, no. 2, 1927, p. 11, figs. 19-23. *Trigonias* Quarry, Chadron Oligocene, Weld County, Colorado.

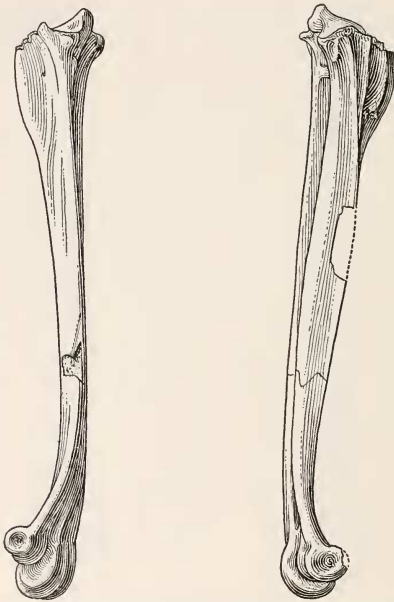
M. Schlaikjer. Proximal face of head irregular in outline, with the two glenoid facets separated by a high intercondylar tubercle that rises abruptly from the anterior margin and slopes down posteriorly to the level of the head of the bone, the inner glenoid facet slightly larger than outer; both facets with raised margins delimiting separate



Figs. 6-7. Two views of type of *Bathornis celeripes*, natural size.

shallow cups, the margins of both rising higher externally; outer facet at a slightly lower level than inner; talon with broad base, marked by a shallow groove that extends transversely across the head of the bone behind the glenoid facets; outer head of talon very slightly indicated as a faint ridge; inner head rising as a strong, heavy ridge with upper end (somewhat imperfect in the type) abruptly rounded; the central

portion with straight outline for a distance, with one tendinal perforation; posteriorly, below the lower end of the perforation mentioned, a thin ridge slopes down to merge with the shaft at slightly below the level of the upper third of the bone, so that, viewed laterally from the inner side, the talon, rising abruptly at the upper end, makes a grace-



Figs. 8-9. Two views of type of *Bathornis celeripes*, natural size.

fully sloping line as it proceeds downward to disappear in the shaft; posterior face of shaft for three-fourths of length marked laterally by sharply angular edges that are raised somewhat, and converge as they proceed downward, the outer margin higher than the inner, and the two bounding a shallow, poorly marked groove; internal surface of shaft concave on side of talon and rounded below; external surface



more nearly plane for two-thirds of length, finally becoming rounded on lower portion; a deep impression on anterior face of shaft at upper end, overhung abruptly by the head, continuing down the shaft as an anterior groove, with raised, rounded margins that extend nearly to lower end; tibialis anticus tubercle strong, placed slightly internal to center of shaft; shaft strong, somewhat slender, robust for upper half and more graceful below, at lower end flattened and expanded to support the trochlea; inferior foramen moderate in size, located low on shaft, with a deeply impressed groove leading into it on anterior surface of shaft; no indication of a first, or posterior, toe; external trochlea blocklike with inner and outer faces deeply excavated, so attached that it is swung posterior to the longitudinal axis of the shaft, rounded



Figs. 10-11. Proximal and distal ends of type of *Bathornis celeripes*, natural size.

in lateral outline, with a distinct groove around free surface; outer margin slightly produced in an angular, plate-like process; middle trochlea strong, rounded in lateral outline, with inner and outer surfaces distinctly excavated and a well impressed median groove completely around articular surface; posteriorly with the external angle cut away and the internal one complete; external trochlea elongated in an antero-posterior direction with inner and outer faces with cup-like excavations and a shallow groove around articular surface; external margin slightly produced in a projecting plate. Bone strongly fossilized, ivory in color.

*Measurements.* Type, total length (approximate) 98.8 mm., transverse diameter of head 15.8 mm., least transverse diameter of shaft 6.6 mm., transverse diameter across trochlea 16.0 mm.

A second specimen (Cat. no. 2235) measures, total length (approximate) 105.0 mm., transverse diameter of head 14.9 mm., transverse diameter of trochlea 14.7 mm.

Additional metatarsi (fragmentary) transverse diameter of head <sup>1</sup> 14.7-17.1 (15.6) mm., least transverse diameter of shaft <sup>2</sup> 15.7-16.4 (16.1) mm., transverse diameter of trochlea <sup>3</sup> 14.7-16.5 (15.6) mm.

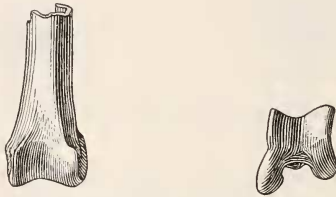
<sup>1</sup> 9 specimens.

<sup>2</sup> 10 specimens.

<sup>3</sup> 16 specimens.

*Remarks.* Unlike most fossil birds, which ordinarily are represented by single fragments, many remains of *Bathornis celeripes* have been obtained. In addition to the type metatarsus the collection now at hand includes one other metatarsus that is nearly complete, with many other fragments, including forty-four specimens of the distal end of the bone and eighteen of the head, the former being in the main in excellent condition. This material has been useful in checking characters and in providing measurements. The series exhibits a uniform appearance as regards form, and shows ordinary variation in dimension, this difference possibly being sexual in part.

There are in addition sixty-five specimens of the distal end of the tibio-tarsus (figs. 12-13) with more or less of the shaft of the bone



Figs. 12-13. Posterior face and lower articular surface of distal end of tibiotarsus of *Bathornis celeripes*, natural size.

attached. Though some of these have been distorted by crushing many of them have the condyles complete and in proper form. Following is description of pertinent characters evident in these specimens; outline of external condyle, viewed laterally, rounded anteriorly and flattened on distal margin, which joins posterior surface at rather an abrupt angle; external surface with margins raised, the posterior portion flaring out as a compressed, platelike process; outer face of internal condyle with anterior portion narrowed and projected forward considerably beyond level of shaft, the margins rounded, lower margin flattened and posterior margin protruded as a thin, raised plate; a rounded tubercle near level of anterior margin of shaft about equidistant from upper and lower margins with a shallow, rounded excavation in front; intercondylar fossa broad and deeply impressed, with the internal condyle rising abruptly from it, the margin of this condyle being thickened somewhat to produce a slight notch; boundary wall of

external condyle sloping outward at an angle of forty-five degrees; articular surface with raised margins bounding an angular sulcus; tendinal bridge (for extensor digitorum communis tendon) strong and heavy, with lip of lower margin projecting prominently, and another projection on external margin of bridge; a broad groove leading into this bridge; shaft somewhat slender, flattened on anterior surface, and rounded behind. Transverse breadth across condyles 12.5-14.8 (13.8),<sup>1</sup> anterior-posterior diameter of inner condyle 13.5-15.5 (14.2),<sup>2</sup>

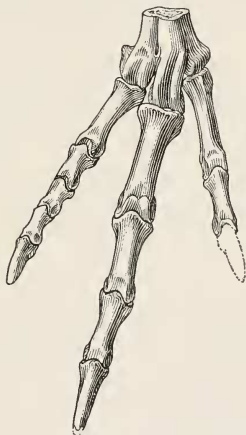


Fig. 14. Articulated foot with distal end of metatarsus of *Bathornis celeripes*, natural size.

of outer condyle 12.0-14.3 (12.7),<sup>3</sup> smallest transverse diameter of shaft, 6.8-8.1 (7.2)<sup>4</sup> mm.

There are present also the heads of three tibio-tarsi, much distorted by crushing that appear to belong to this species. They are similar so far as may be ascertained to *Bathornis cursor*, being proportionately smaller. The general appearance of the tibio-tarsus is that of *Cariama*.

In one of the slabs containing avian fossils there was found the distal end of a right metatarsus with the toes articulated (fig. 14), the

<sup>1</sup> 19 specimens.

<sup>2</sup> 15 specimens.

<sup>3</sup> 18 specimens.

<sup>4</sup> 8 specimens.

phalanges being complete except for the unguis of the second toe. This specimen is one of the most important in the series since it is this that demonstrates the relationship of *Bathornis* with *Cariama*, a fact that while indicated from other portions of the skeleton, from them alone does not seem to be absolutely certain. In this foot the end of the second phalanx of the second toe extends barely beyond the base of the second phalanx of the middle toe. In the fourth or outer toe the penultimate phalanx does not extend to the distal end of the second phalanx of the middle toe, and the second to the fourth phalanges are individually much shortened. In all these characters the fossil resembles *Cariama*.

The Oedienemidae (*Oedienemus* and *Burhinus*) have the end of the second phalanx of the second toe reaching nearly to the middle of the second phalanx of the middle toe, and the distal end of the fourth phalanx of the fourth toe reaching nearly to the middle of the third phalanx of the middle toe.

The second toe of *Bathornis ecleripes* (without the unguis) measures 27.3 mm., the third toe (with unguis) 55.9 mm., and the fourth toe (with unguis) 39.5 mm. Many disassociated phalanges are present in the collection.

In connection with this long array of specimens from the Torrington deposits it is of interest to record a find of *Bathornis ecleripes* in another locality. In the collections of the U. S. National Museum (Division of Vertebrate Paleontology Cat. no. 12,974) there is the distal end of a right tibio-tarsus obtained on the Everson Ranch twelve miles northwest of Crawford, Nebraska in the Oreodon beds of the Oligocene. The locality is approximately 60 miles northeast of the Torrington locality. The bone, in excellent condition, not being distorted as is the case with so many of the bones from Torrington, was collected on July 16, 1932 by M. V. Walker, working under direction of C. W. Gilmore of the National Museum.

This specimen in its conformation is identical with bones from Torrington, being in fair condition except in the region of the supratendinal bridge where it is imperfect. In size it is very slightly less than the smallest of the Torrington series now at hand but the difference is slight and is considered an individual aberration. Measurements are as follows: Transverse breadth across condyles 11.9 mm., anterior-posterior diameter of inner condyle 12.7 mm., of outer condyle 11.5 mm. The remnant of the shaft is too short to afford a comparative measurement.

Considering the abundance of remains from the lower limb the small

number of bones discovered that come from the wing seems strange. There is one fragment from the distal end of a right humerus that is taken to represent the present species, but that is in such condition that it tells little of the story that it should carry. The portion of the shaft present is more or less crushed and broken so that though the brachial depression is well indicated its proper shape is uncertain. The bone in general has resemblance to the humerus in *Cariama* but is slightly smaller with relatively smaller condyles. The ulnar condyle is partly missing and there is other evidence of artificial deformation during fossilization so that little more may be said regarding it and no detailed description is attempted.

Of greater importance are four fragmentary metacarpals that also may be compared with *Cariama*. All four are from the left side, one being reasonably complete except for the slender fourth metacarpal element, another lacking in addition a part of the proximal end, a third nearly complete but partly crushed, and a fourth consisting of the proximal end alone. The general form is reminiscent of that of *Cariama* but there are important differences to be noted. The proximal articular surface in the fossil has about the same outline, but is much more prolonged on the lower margin, the ridge of carpals 4 and 5 being continued forward past the level of the articular facet for the pollex. The fourth metacarpal so far as may be told from the ends that remain was flattened from above downward, without the downward curve and the produced, platelike form seen in *Cariama*. The second metacarpal is stronger and heavier with the proximal end more produced. The shaft of the third metacarpal is strong and heavy resembling *Cariama* with the tuberculum ulnare less produced. The most perfect specimen measures 54.2 mm. long, with the perpendicular diameter through the head 16.2 mm., and through the distal end 11.7 mm.

The general indication is of a relatively longer wing than in *Cariama* with the probability that *Bathornis ecleripes* was a form that used its wings regularly in flight.

From the abundance of its remains *Bathornis ecleripes* must have been very common. It was evidently a ground-inhabiting species, with relatively shorter legs than the modern *Cariama* but a form of stronger flight. From its relative abundance it is probable that it was gregarious, perhaps somewhat as the sand-grouse are today. As the deposits from which it comes are extensive it may be expected that further parts of the skeleton will be found.

## BATHORNIS CURSOR, new species

*Characters.* Metatarsus in form like that of *Bathornis celeripes* Wetmore but decidedly larger; similar to *Bathornis veredus* Wetmore<sup>1</sup> but somewhat smaller, with middle and outer trochlea relatively smaller and the external trochlea relatively heavier.

*Description.* Type, distal end of left metatarsus (figs. 15-19), Mus. Comp. Zoöl. Cat. no. 2236, from Upper Oligocene deposits four miles from Torrington, Goshen County, Wyoming, collected by Erich M.



Figs. 15-16. Two views of type of *Bathornis cursor*, natural size.

Schlaikjer. Lower end of shaft compressed and flattened transversely so that the bases of the trochlea are nearly in the same transverse plane; inferior foramen moderate in size, located in a deeply impressed groove that continues into the inter-trochlear sulcus; external trochlea compressed laterally, with the outer and inner faces nearly parallel, both being considerably excavated; articular surface shallowly grooved entirely around; external posterior margin produced as a narrow, backward projecting plate (partly broken away in this specimen), distal margin extending to two-thirds the height of the middle trochlea, the trochlea swung somewhat backward; middle trochlea with parallel sides which are deeply excavated, the margins on the posterior face approaching one another as they rise to merge in the shaft; a shallow median groove entirely around articular surface; internal trochlea block-like with broadened base and narrow extremity, inner and outer surfaces being deeply excavated; articular surface grooved completely around; a small, projecting plate on outer posterior margin (partly broken away); the trochlea relatively small and swung somewhat posterior to the transverse line of the middle trochlea, extending distally to center of middle trochlea. Color dull ivory white, strongly fossilized.

*Measurements.* Greatest transverse breadth across trochlea 20.1 mm. (Other pertinent measurements not available from type.)

<sup>1</sup> *Bathornis veredus* Wetmore, Proc. Colorado Mus. Nat. Hist., vol. 7, no. 2, 1927, p. 11, figs. 19-23, Chadron Oligocene, Weld County, Colorado.

*Remarks.* The type of this species is nearly as large as *Bathornis veredus* from the lower deposits of the Oligocene, differing in form in the lighter development of the trochlea. In general appearance *cursor* is a large edition of *Bathornis celeripes* from the same deposits.

In addition to the type there are several fragmentary bones that are identified as belonging to this same species.



Figs. 17-19. Three views of type of *Bathornis cursor*, natural size.

The head of a left tibio-tarsus somewhat crushed, is suggestive of *Cariama* except that the internal surface is not quite so deeply excavated.

A right femur is nearly complete but has been considerably crushed. While generally similar to *Cariama* it is more slender and more gracefully formed, and is also longer, a part but not all of this appearance of greater length being due to crushing. It measures 103.7 mm. in length. While its general characters have been preserved they have been somewhat modified and so are not described. The collection includes also the distal ends of three left and one right femora.

There are present also three phalanges from the middle toe including one basal segment and two second phalanges, as well as an ungual phalanx.

Representation of a large and a small species of *Bathornis* in the same deposits is of considerable interest. The larger form seems to have been about twice the size of the smaller, and judging from the relative number of specimens known was less abundant.

Following are the three species at present known in the family Bathornithidae.

*Bathornis veredus* Wetmore, Chadron formation, Weld County, Colorado, and Titanotherium beds, near Crawford, Nebraska.

*Bathornis celeripes* Wetmore, Upper Oligocene, Torrington, Wyoming.

*Bathornis cursor* Wetmore, Upper Oligocene, Torrington, Wyoming.